

Remarks

Claims 14, 18-22, 40, 43-46, 60, and 63-79 are pending in the application, with 14, 40, 63, 70, and 77 being the independent claims. The Examiner withdrew claims 40 and 43-46 from consideration. Based on the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Rejections under 35 U.S.C. § 103

The Examiner rejected claims 14, 18-22, 60, and 63-79 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,583,377 to Higgins III (hereinafter Higgins-1) in view of U.S. Patent No. 6,020,637 to Karnezos (hereinafter Karnezos) and U.S. Patent No. 5,291,062 to Higgins III (hereinafter Higgins-2). Applicants respectfully traverses the rejection, and requests that it be reconsidered and withdrawn.

The Examiner stated that Higgins-1 discloses "a heat sink/stiffener (22 in FIG. 1) having a first and second surface, where the second surface is attached to the first substrate surface" Applicants disagree with the Examiner's characterizations of Higgins-1. Higgins-1 does not teach or suggest a stiffener as described in the specification of the present invention, and recited in claim 14.

FIG. 1 of Higgins-1 illustrates a semiconductor device 10. In device 10, a substrate 12 includes an opening 20 which extends completely through substrate 12. Positioned within opening 20 is a heat sink 22. Heat sink 22 includes a base portion 24, sidewalls 26, and flanges 28. Together, the base portion and side walls of heat sink 22 form a cavity for receiving a

semiconductor die 13. Die 13 is mounted to base portion 24. Flanges 28 rest on a top surface of substrate 12 (col. 3, line 11-col. 4, line 28).

Heat sink 22 is configured such that base portion 22 is thicker than flanges 28. One reason is that by keeping flanges 28 thin, the profile or height of device 10 can also be kept small. Also, conductive wires 19 coupled over flanges 28 create a potential for short-circuiting. The short-circuiting probability can be reduced by making flanges as thin as possible, among other things (col. 4, lines 44-55).

Higgins-1 is different from the present invention. Claim 14 of the present invention recites a stiffener. Higgins-1 does not teach or suggest a stiffener, as described in the specification of the present invention, and as recited in claim 14. As recited in the specification on page 10, lines 2-3, "a stiffener can be attached to the substrate to add planarity and rigidity to the package." The stiffener recited in claim 14, and described in the specification, provides planarity and rigidity to the corresponding BGA package. Heat sink 22 of Higgins-1 is not a stiffener. Heat sink 22 of Higgins-1 does not provide either planarity or rigidity to semiconductor device 10. Heat sink 22 is centrally located in semiconductor device 10, being positioned in opening 20 of substrate 12. Because of its size and location, heat sink 22 is not capable of providing either planarity or rigidity to semiconductor device 10. Higgins-1 further emphasizes a desire to make flanges 22 of heat sink 22 as thin as possible, as described above, which further teaches away from providing rigidity to semiconductor device 10. Thus, heat sink 22 is not a stiffener.

Hence, Higgins-1 does not teach or suggest a stiffener, as described in the specification and recited in claim 14 of the present invention. Furthermore, Karnezos and Higgins-2 do not supply the missing teachings. Accordingly, Applicant respectfully submits that claim 14 is

patentable over Higgins-1, alone or in combination with Karnezos and Higgins-2, for at least the reasons described above. Furthermore, independent claims 63, 70, and 77, are also patentable over Higgins-1, alone or in combination with Karnezos and Higgins-2, for at least these reasons, and further in view of their own respective features. Claims 18-22, 60, 64-69, 71-76, 78, and 79, which depend therefrom, are also patentable. Applicant therefore requests that the Examiner reconsider and withdraw these rejections of claims 14, 18-22, 60, and 63-79.

Conclusion

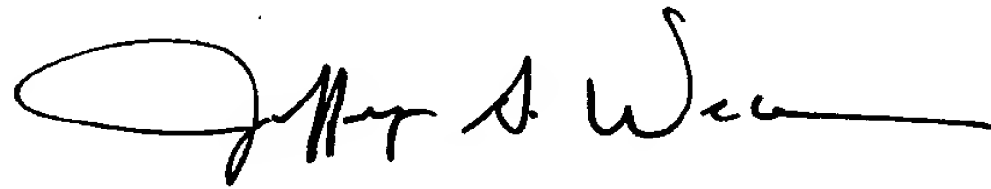
All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for

any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

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